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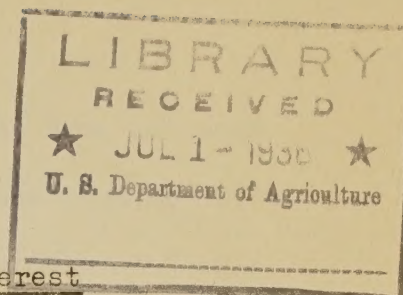


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ANIMAL HUSBANDRY DIVISION  
HAWAII AGRICULTURAL EXPERIMENT STATION  
HONOLULU, HAWAII

USDA from G.E.S.

Under the joint supervision of the  
UNIVERSITY OF HAWAII  
and the  
UNITED STATES DEPARTMENT OF AGRICULTURE



Progress Notes on Experiments and Other Items of Interest

No. 13

April, 1936

These progress notes on experimental work and other items of interest to livestock men in the Territory are issued from time to time by the Animal Husbandry Division. You are invited to suggest other lines of research that you deem important and to submit inquiries to the University.

RATIONS USING MAXIMUM AMOUNTS OF PINEAPPLE BRAN AND

CANE MOLASSES FOR DAIRY COWS

by L. A. Henke and G. W. H. Goo

Introduction

Both pineapple bran and cane molasses have been fed to dairy cows at the Hawaii Station in a number of experiments and generally with satisfactory and economical results. Some of these results have been published and are available for distribution.<sup>1</sup> These feeds have also been widely fed by dairymen throughout the Territory.

In the present experiments both of these low cost local by-products were combined in the same ration in an attempt to effect still further economy.

Plan of Experiments

Each of the three experiments to be summarized in this report were the same in general plan and rations fed. They differ only in the time when the experiment was conducted and different cows were used in the different experiments. The experiment was repeated three times in order to get more

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<sup>1</sup>Henke, L. A.--Pineapple Bran as a Feed for Livestock. Circular No. 2, Hawaii Agricultural Experiment Station (1931)  
Henke, L. A.--Cane Molasses as a Feed for Dairy Cows. Bul. No. 73, Hawaii Agricultural Experiment Station (1934)



UNITED STATES DEPARTMENT OF AGRICULTURE  
BUREAU OF PLANT INDUSTRY  
WASHINGTON, D. C.

Under the joint sponsorship of the

UNIVERSITY OF HAWAII

and the

UNITED STATES DEPARTMENT OF AGRICULTURE

Technical Notes on Experimental and Other Lines of Interest

April, 1935

No. 12

These technical notes on experimental work and other lines of interest in the territory are issued from time to time by the Bureau of Plant Industry. You are invited to suggest other lines of research that you deem important and to submit inquiries to the University.

HAWAIIAN BUREAU OF PLANT INDUSTRY, UNIVERSITY OF HAWAII

CARE WILLIAM H. HARRIS, CHIEF

Dr. L. A. Harris and G. W. E. Cox

Introduction

From scientific point and even religious have been led to study some of the results of the work in a number of experiments the results of the experiments of the Hawaiian Bureau of Plant Industry. Some of these results have been published and are available for distribution. These results have also been widely distributed by various persons in the territory.

In the present experiments work of these for some local experiments were combined in the same system in an attempt to effect still further economy.

Plan of Experiment

Each of the three experiments to be mentioned in this report were the same in general plan and method. They differ only in the time when and treatment was conducted and different seed was used in the different experiments. The experiment was repeated three times in order to get more

Harris, L. A.—Hawaii. Seed as a Food for Livestock. Circular No. 2, Hawaii.  
Harris, L. A.—Hawaii. Seed as a Food for Livestock. Circular No. 2, Hawaii.  
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Harris, L. A.—Hawaii. Seed as a Food for Livestock. Circular No. 2, Hawaii.

reliable data than is possible from one experiment.

In each experiment a ration consisting largely of pineapple bran and cane molasses with soybean oil cake meal as the protein supplement was compared with another ration consisting of imported feeds which we have repeatedly used as a check or control ration which we designate as the medium high protein ration.

In each experiment two lots of cows, A and B, were used and the double reversal system of feeding was used. Each experiment consisted of three equal periods. Lot A was fed the pineapple bran-molasses ration the first period, the medium high protein feed the second and the pineapple bran-molasses ration the last period. Lot B was fed the medium high protein ration during the first and last period and the pineapple bran-molasses ration the middle period. The mean of the first and last periods of each lot was compared with the middle period in order to compensate for decreasing production due to advancing lactation. While each lot constituted a complete experiment, only the averages of the two lots for each experiment are given in this condensed summary.

The reversal system of feeding used is best shown in the table below:

Lot A		Lot B	
Period I	: Pineapple bran-molasses	: Medium high protein	
Period II	: Medium high protein	: Pineapple bran-molasses	
Period III	: Pineapple bran-molasses	: Medium high protein	

Each period in each experiment consisted of four weeks only the last three of which were used in computing results. Six cows were used in each of the three experiments.



reliable data than is possible from one experiment.

In each experiment a portion of the total supply of glucose was converted with glucose with glucose at each meal as the glucose supplement was converted with another portion of the total supply of glucose which we have repeatedly used as a control portion which we designate as the control and glucose portion.

In each experiment two lots of cows, A and B, were used and the glucose portion of the total supply was used. Each experiment consisted of three equal periods. Lot A was fed the glucose plus-molasses ration the first period, the glucose plus protein feed the second and the glucose plus-molasses ration the last period. Lot B was fed the glucose plus protein ration during the first and last period and the glucose plus-molasses ration the middle period. The same of the first and last periods of each lot was compared with the middle period in order to compensate for lactation production due to replacement lactation. This each lot contained a complete experiment, only the two lots of the two lots for each experiment are given in this section's summary.

The general system of feeding used is shown in the table below:

Lot A		Lot B	
Period I	Glucose plus-molasses	Period I	Glucose plus protein
Period II	Glucose plus protein	Period II	Glucose plus-molasses
Period III	Glucose plus-molasses	Period III	Glucose plus protein

Each portion in each experiment consisted of four meals only the last two of which were used in comparing results. It was also used in each of the three experiments.

Body Weights and Fat Tests

The cows were weighed once each week while the experiments were in progress. A fat test of the milk of each cow was also made weekly. This weekly fat test was based on a composite sample representing four consecutive milkings.

The Concentrate Feed Mixtures

Medium High Protein Ration

	<u>Pounds Digestible</u>		<u>Nutritive Ratio</u>
	<u>Crude Protein</u>	<u>Total Nutrients</u>	
200 lbs. soybean oil cake meal	79.4	169.0	
480 " wheat bran	60.0	292.3	
300 " rolled barley	27.0	238.2	
12 " raw rock phosphate or bone meal	--	--	
<u>12</u> " salt	<u>--</u>	<u>--</u>	
1004 " mixture	166.4	699.5	
100 " "	16.6	69.7	1:3.20

Pineapple Bran-Molasses Ration

500 lbs. pineapple bran	4.0	299.5	
200 " cane molasses	2.0	119.0	
400 " soybean oil cake meal	158.3	338.0	
13 " raw rock phosphate or bone meal	--	--	
<u>13</u> " salt	<u>--</u>	<u>--</u>	
1128 " mixture	164.8	756.5	
100 " "	14.6	67.2	1:3.6

While the pineapple bran-molasses ration carried two percent less crude protein than did the medium high protein ration, both rations in the quantities fed together with the roughages supplied ample protein and total nutrients according to the Morrison feeding standard.







Feed Prices

The feed prices varied during the different experiments. The table below shows the feed costs during the different tests and these were the prices used in computing the feed cost of milk production shown in later tables.

Experiment number	:	I	:	II	:	III
	:	11-1-34 -	:	4-4-35 -	:	8-8-35 -
Inclusive dates	:	1-23-35	:	6-26-35	:	10-30-35
	:	Price per ton				:
Soybean oil cake meal	:	\$37.00	:	\$38.00	:	\$36.60
Wheat bran	:	30.00	:	32.00	:	32.60
Rolled barley	:	37.00	:	32.00	:	32.00
Raw rock phosphate	:	42.00	:	42.00	:	
Steamed bone meal	:		:		:	60.00
Salt	:	8.00	:	8.00	:	8.00
Pineapple bran	:	14.00	:	14.00	:	14.00
Cane molasses <sup>1</sup>	:	10.00	:	10.00	:	10.00
Green alfalfa <sup>1</sup>	:	10.00	:	10.00	:	
Green Sudan grass <sup>1</sup>	:	6.00	:	6.00	:	6.00
Green Panicum grass <sup>1</sup>	:	6.00	:	6.00	:	
Green Napier grass <sup>1</sup>	:	6.00	:	6.00	:	6.00

<sup>1</sup>Assumed prices.

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Milk Production, Feed Consumption and Costs

The more important details of production, quantity of feeds consumed, costs, weights and fat tests are shown in the following condensed table.

	Exp. I		Exp. II		Exp. III		Average Exp. I, II, III	
	Medium high protein	Pine bran molasses	Medium high protein	Pine bran molasses	Medium high protein	Pine bran molasses	Medium high protein	Pine bran molasses
Average pounds milk per cow per day	24.9	24.3	24.4	23.2	26.5	26.7	25.3	24.7
Average percent butter fat	3.79	3.69	3.70	3.70	3.84	3.72	3.78	3.70
Average body weight, pounds	1030.	1029.	977.	976.	993.	980	1000.	995.
Average lbs. con- centrates fed per cow per day	14.81	15.00	13.28	13.19	16.10	16.10	14.73	14.76
Lbs. milk produced per pound of concentrates fed	1.68	1.62	1.84	1.76	1.65	1.66	1.72	1.68
Average lbs. green roughage consumed per cow per day	59.5	59.0	64.0	61.0	38.5	33.2	54.0	51.0
Concentrate feed cost per 100 lbs. milk produced	\$ 0.99	\$ 0.67	\$ 0.90	\$ 0.63	\$1.01	\$ 0.66	\$ 0.97	\$0.65
Total feed cost per 100 lbs. of milk produced	1.73	1.42	1.77	1.49	1.45	1.03	1.65	1.31

The economy of the pineapple bran-molasses ration is best shown in the percentage cost per 100 pounds of milk produced on this ration when the cost of the medium high protein ration produced milk is assumed to be 100 percent. On this basis the percentage concentrate feed cost of the pineapple bran-molasses produced milk is as follows:

Experiment I 67.7

Experiment II 70.0

Experiment III 65.3

Average 67.7







### Summary and Conclusions

1. In this series of three dairy cattle feeding experiments a ration consisting of 62 percent locally produced by-products (44.4 percent pineapple bran, 17.8 percent cane molasses) was compared with another ration consisting entirely of imported feeds.

2. Average daily milk production per cow per day was 25.3 pounds and 24.7 pounds on the imported and the largely locally produced ration, respectively, or production was two percent less when the locally produced ration was fed. The concentrate feed cost of milk production was 32 percent lower when the pineapple bran-molasses ration was fed.

3. In these cost figures cane molasses was valued at \$10 per ton. Often it would cost less than this figure resulting in even greater economy.

4. There was no significant reduction in live weight of the cows or fat content of the milk when the locally produced ration was fed.

5. The results of each of the three experiments reported here are similar and hence it seems that reasonable reliance may be placed on them.

6. Since cane molasses and pineapple bran have a similar composition as regards crude protein and total nutrients (although pineapple bran is much higher in fiber) it is believed that an additional 100 pounds of cane molasses could perhaps be substituted for 100 pounds of the pineapple bran which would result in greater economy in some localities where molasses is very cheap. Such an exchange would result in no appreciable loss in nutrients, but it would make a stickier feed mixture which might be more laxative.



